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### **Improvement in tubercular cavities following adjuvant treatment with endobronchial valves: a case report**

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### Improvement in tubercular cavities following adjuvant treatment with endobronchial valves: a case report

In 2010, multidrug-resistant tuberculosis (MDR-TB) occurred in 650 000 of the 12 million TB cases worldwide,<sup>1</sup> with extensively drug-resistant (XDR) TB comprising 9% of the MDR-TB cases.<sup>2</sup> Treatment success is between 44% and 60%.<sup>3</sup> We hypothesised that a recent form of lung collapse therapy—the insertion of Zephyr® endobronchial valves (EBVs; Pulmonx, Redwood, CA, USA)—may be effective in the treatment of MDR/XDR-TB. This minimally invasive procedure is usually indicated for reducing emphysema-associated hyperinflation.<sup>4</sup> The one-way valve allows air and secretions to leave the lobe, but prevents air from entering, bringing about lobar collapse.

A 29-year-old female patient was admitted for treatment for XDR-TB in January 2011. She had been diagnosed with MDR-TB in Romania in 2006, with a further relapse in 2009. In 2011, the diagnosis was changed to XDR-TB. She was considered ineligible for surgery due to extensive disease.

Sputum culture recorded heavy growth of *Mycobacterium tuberculosis*. A computed tomography (CT) scan (26 January 2011) showed multiple cavities in the left lower lobe, left upper lobe (LUL), right middle lobe (RML), and right lower lobe.

Based on the results of drug susceptibility testing, treatment was initiated in January 2011 with intravenous imipenem/cilastatin, amikacin, linezolid and

oral clofazimine. The patient showed no improvement in asthenia, persistent coughing, intermittent fever or haemoptysis. Continuous evaluation by sputum analysis and CT (March 2011) showed no improvement.

Given the patient's deteriorating condition, we considered EBV placement. Pre-treatment CT was performed (Figure 1A). On 19 May 2011, two 4-mm Zephyr® valves were inserted into the lateral and medial segmental bronchi of the middle lobe bronchus under local anaesthesia and conscious sedation. On 27 May 2011, terizidone was added to the treatment.

A follow-up CT at 1 month (Figure 1B) showed a marked reduction in the size of the RML cavity. However, sputum culture remained positive. The first negative culture was obtained in a sample on 21 September. Treatment with TMC207 (an experimental drug) was commenced on 1 October. In October, the direct sample was sporadically positive. At the end of October, both sputum smear and culture became definitively negative. A CT scan in November 2011 (not provided) showed resolution of the RML cavity.

On 11 January 2012, in a single procedure, the two EBVs were removed from the RML, and a 5.5-mm Zephyr® valve was placed in the apicoposterior branch of the LUL where a cavity persisted (Figure 2A). Follow-up CT at 1 month showed that the cavity in the LUL had reduced in size (Figure 2B). The patient was now asymptomatic.

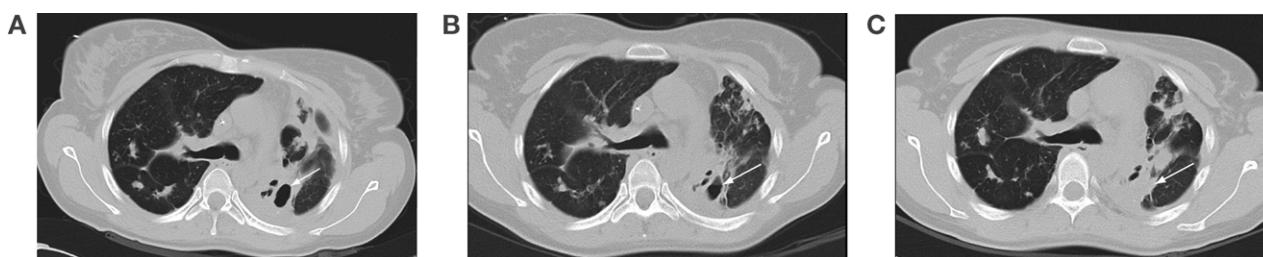
A recently conducted 10-month follow-up CT (October 2012) demonstrated a further reduction in the size of the LUL cavity (Figure 2C) and stability of the RML (Figure 1C). Sputum smear and culture remained negative. The remaining EBV was subsequently removed.

We hypothesised that using Zephyr® EBV to create hypoventilation and hypo-oxygenation of the lung lobe would promote healing of the tubercular cavity. In our case, Zephyr® EBV placement resulted in reductions in cavity size in each of the treated lobes within 1 month. Sputum smear and culture became negative 5 months after EBV placement. No EBV-related complications occurred.

To our knowledge, our case provides the only



**Figure 1** Chest CTs clearly showing changes in the cavity in the RML. **A.** Pre-treatment CT scan (May 2011) clearly showing the cavity (2.0 × 1.1 cm) in the RML (arrow). **B.** 1-month follow-up CT scan (June 2011) showing resolution of the cavity (arrow) and the two EBVs in place (arrowheads). Of note, there was a spontaneous reduction in the size of a cavity in the LUL (from 3.2 × 1.9 to 2.1 × 1.5 cm), which was later targeted (see Figure 2). **C.** 17-month follow-up CT scan (October 2012) demonstrating stability of the RML after removal of the EBVs. CT = computed tomography; RML = right middle lobe; EBV = endobronchial valve.



**Figure 2** Chest CTs clearly showing changes in the cavity in the LUL. **A.** CT scan 2 months before second EBV implantation (November 2011). The size of the cavity in the LUL had remained stable ( $2.1 \times 1.2$  cm) since the CT scan taken in June 2011 (see Figure 1B). **B.** 1-month follow-up CT scan (February 2012) showing a reduction in the size of the cavity ( $1.7 \times 1.0$  cm) in the LUL (arrow). **C.** 10-month follow-up CT scan (October 2012) showing resolution of the cavity (EBVs still in place). CT = computed tomography; LUL = left upper lobe; EBV = endobronchial valve.

radiographic evidence supporting the effectiveness of EBVs in closing tubercular cavities. The only other reports on a similar technique are from Russia,<sup>5</sup> where improvement in the tubercular process was reported in 89 patients with MDR-TB and 118 patients with infiltrative pulmonary TB.

More detailed information on this case (clinical outcomes and high-resolution figures) can be obtained from the corresponding author upon request.

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#### ERRATA

IN THE ARTICLE entitled ‘Time to act to prevent and control tuberculosis among inmates’ by M. Dara, S. S. Chadha, N. V. Melchers, J. van den Hombergh, E. Gurbanova, H. Al-Darraj, J. B. W. van der Meer (*Int J Tuberc Lung Dis* 2013; 17(1): 4–5; <http://dx.doi.org/10.5588/ijtld.12.0909>), the name of author N. V. Melchers should have read N. V. S. Vinkeles Melchers, and her affiliation should have read: Academic Medical Center, Department of Global Health, University of Amsterdam, Amsterdam Institute for Global Health and Development, Amsterdam, The Netherlands. [<http://dx.doi.org/10.5588/ijtld.12.0909-e>]

IN THE ARTICLE entitled ‘Trends in the annual risk of tuberculous infection in India’ by V. K. Chadha, R. Sarin, P. Narang, K. R. John, K. K. Chopra, R. Jitendra, D. K. Mendiratta, V. Vohra, A. N. Shashidhara, G. Muniraj, P. G. Gopi, P. Kumar (*Int J Tuberc Lung Dis* 2013; 17(3): 312–319; <http://dx.doi.org/10.5588/ijtld.12.0330>), the affiliation for G. Muniraj should have read Department of Community Medicine, Christian Medical College, Vellore, Tamil Nadu. [<http://dx.doi.org/10.5588/ijtld.12.0330-e>]